

Tribal Colleges & Universities Project (TCUP)
Administered by the American Indian Higher Education Consortium (AIHEC)
Cooperative Agreement
Project Manager: Dr. Nancy Maynard
NASA Goddard Space Flight Center
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PROJECT DESCRIPTION

NASA's Tribal Colleges and Universities Project (TCUP) is a science, technology, engineering and mathematics (STEM) educational grant and mentoring program that specifically targets Tribal Colleges and Universities. The overall goal of the project is to expand opportunities for the nation's STEM workforce through capacity building, infrastructure development, research experience, outreach, and information exchange. There are three primary elements of the project: 1) The TCUP Summer Research Experience (SRE), which provides NASA research, engineering, and education opportunities to Tribal College and University faculty and students; 2) The TCUP Enrichment Grant program, which provides funding for the improvement of education, research, and learning infrastructures; and 3) TCUP STEM planning, coordination, and information exchange activities.

PROJECT GOALS

1. Focus the Agency's attention on identifying and removing barriers to TCU participation in NASA programs that support Science, Technology, Engineering, and Mathematics (STEM) education and achievement by providing NASA Research Experiences for TCU Faculty and Undergraduates at each NASA Center. (Supports HE objectives 1.1, 1.2, and 1.3 for Outcome 1)
2. Expand outreach activities to improve the relationships between TCUs and NASA, with particular attention paid to activities designed to increase TCU familiarity with the Agency. Strengthen collaboration between NASA and AIHEC to improve high quality NASA education and research opportunities at the 36 Tribal Colleges. (Supports HE objectives 1.1, 1.2, and 1.3 for Outcome 1)
3. Enhance TCU STEM infrastructure, such as through creation of pre-engineering or engineering courses to establish an Engineering degree-granting program that will enable TCUs to expand research for Science and Exploration Systems. (Supports HE objectives 1.1, 1.2, 1.3, 1.4, 1.5 for Outcome 1)

PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

The Tribal College and University Project (TCUP) supports:

Objective 1.1 Faculty and Research Support: TCUP provides NASA competency-building education and research opportunities for faculty and researchers in several different ways: (1) The 2009 Summer Research Experience Internship/Externship Program provided research opportunities for 11 faculty members at 6 NASA Centers and/or at their own Tribal College; (2) one faculty member was able to conduct NASA-relevant research through NASA-AIHEC

Enrichment grants; and (3) 17 faculty members carried out research on NASA & climate related issues through the TCU Climate Change Initiative.

Objective 1.2 Student Support: (provides NASA competency-building education and research opportunities to individuals to develop qualified undergraduate & graduate students who are prepared for employment in STEM disciplines at NASA, industry, and higher education), and

Objective 1.3 Student Involvement Higher Education: (provide opportunities for groups of post-secondary students to engage in authentic NASA-related, mission-based R & D activities) through (1) the 2009 Summer Research Internship/Externship Program in which 38 students carried out NASA-related scientific projects in cooperation with a NASA/science or engineering mentor at 6 NASA Centers and/or at their own Tribal College; (2) 21 students worked on science and engineering research projects through support of the NASA-AIHEC Enrichment Grants; and (3) 34 students did research projects through the TCUP Climate Change Initiative

Objective 1.4 Course Development: TCUs were supported in the following manner: (1) provided NASA engineering expertise to help establish an accredited B.S. in Computer Engineering degree program, the first four-year engineering program offered by any of the 36 tribal colleges in the United States at Salish Kootenai College; (2) the 2009 SRE Externship created special course material for the 3-weeks teaching experience at United Tribes Technical College Externship for the 26 students and 8 faculty in attendance in such areas as climate change, GIS, GPS, remote sensing, and, the scientific method; and (3) Navajo Technical College is creating a new course in 3D modeling, laser scanning and rapid prototyping services in collaboration with Marshall Space Flight Center. This course is intended specifically to prepare students for work assignments in these specialized skill areas, and eventually allow Navajo Technical College to contract with NASA for these services. In addition to building on this work, NTC is developing a 3D design course specifically for Boeing Corporation personnel.

Objective 1.5 Targeted Institution Research and Academic Infrastructure: The AIHEC grant supported a series of Enrichment Grants to TCUs to build/strengthen their research and education capabilities. An example is the development of rapid prototyping, laser scanning, and advanced manufacturing courses at Navajo Technical College developed specifically to prepare students to work at NASA or for NASA contractors.

PROJECT ACCOMPLISHMENTS

- 1. Removing barriers to TCU participation through NASA Research Experience for Faculty & Students.** For those students reluctant or unable to leave their homes, children, families, and jobs, NASA created the “externship” program in which the initial 3-week NASA portion of the program was held at a tribal college (within driving distance for many of the participants) rather than a NASA Center and then the remaining 7 weeks of research was conducted at their home institutions, resulting in a minimum amount of time away from families. As a result of the externship, 100% of the students and faculty enthusiastically completed their research.
- 2. Outreach.** NASA and AIHEC increased communications to TCUs through active support of TCU student and faculty participation in meetings such as two meetings of the American Indian/Alaska Native Climate Change Working Group at Haskell Indian Nations University, The Tribal College Forum, “Red Alert: The Impact of Climate Change on Northwest Coast Tribal Fisheries at Northwest Indian College”, the Workshop

on Climate, Drought and Early Warning on Western Native Lands, and through the AIHEC portal/ website and the website for the American Indian/Alaska Native Climate Change Working Group. Conference call coordination took place regularly throughout the year among NASA, AIHEC and Tribal College participants to coordinate and enhance information flow.

3. **Enhance TCU STEM infrastructure.** Provided NASA engineering expertise to help establish an accredited B.S. in Computer Engineering degree program, the first four-year engineering program offered by any of the 36 tribal colleges in the United States.

PROJECT CONTRIBUTIONS TO PART MEASURES

Continued TCU STEM faculty and students summer research experience program at several NASA Centers during FY08 and FY09 (*Maps to APG 1 and Outcome 1: 1.1, 1.2, 1.3*)

1.1: Faculty received training in GIS and remote sensing that prepared them to conduct earth surface dynamics research activities locally.

1.2: Students worked with their faculty mentors on research teams that were given research methods training at a tribal college, after which they returned to their home institutions to conduct research in such areas as watershed and grasslands ecology.

1.3: Six NASA Centers worked with 38 students on a variety of projects under the SRE program. This provided all participants valuable exposure to the reality of working with NASA and other scientists and engineers either at a NASA Center with professional researchers or at a tribal college training session with NASA, USGS, and university scientists/instructors.

Provide enrichment grants (under \$25,000) to enhance NASA relevant education and research opportunities (*Maps to APG 2 and Outcome 1: 1.1, 1.2, 1.3, 1.4, 1.5*).

1. Blackfeet Community College (BCC)

Student interns conducted fieldwork, identifying and inventorying native species found in ecosystems throughout Blackfeet country.

2. Chief Dull Knife College (CDKC)

This project involved aerial photographs from a tethered blimp to study invasive species and water changes along the Tongue River.

3. College of Menominee Nation (CMN)

The overall goal of this research project was to increase the understanding of climate change and its impacts on indigenous people by engaging students, staff, and faculty in research investigations.

4. Diné College

The project involved students conducting water quality sampling in the Northern Agency of the Navajo Nation, the administration of community surveys (NNIRB approved) on water issues, and watershed restoration and monitoring activities.

5. Fort Berthold Community College

Students examined the potential impact that oil development may have on climate change on the Fort Berthold Indian Reservation, and identifying potential adaptive measures that could be taken by the tribal leadership.

6. Ilisagvik College

Students conducted field work with research scientists working in the Barrow area and interviewed local experts regarding traditional knowledge related to their respective study subjects.

7. Leech Lake Tribal College

Faculty and students conducted a literature review to identify climate related issues that are likely to affect the Leech Lake Reservation. The results were shared with the Leech Lake community.

8. Bay Mills Community College

The project involved an analysis of community agricultural practices and their relationship to emerging climate change issues.

9. Northwest Indian College

The project involved participatory research with traditional ecological knowledge specialists.

10. Cankdeska Cikana Community College

The project involved conducting baseline research on wind and general weather characteristics to determine if the wind on or near the college campus could support a wind turbine.

11. Sitting Bull College

Students and faculty of the Environmental Science program collected and investigated comments from elders and community members associated with changes in the seasonal availability and timing of plant and animal species.

12. Sinte Gleska University

The project identified the impacts of energy, social, and technological adaptations to climate change and increased global competition for energy resources, and established a framework for rationalizing tribal energy policy.

13. Salish Kootenai College

The project involved an investigation of phenologic and hydrologic changes and their impacts on Salish and Kootenai tribal cultural uses of natural resources.

14. Tohono O'odham Community College

The project developed a climate change course and involved a community survey of the effects of global warming on the Tohono O'odham Nation, guest speakers, field trips to examine specific environmental changes that might be attributed to climate change.

15. United Tribes Technical College

Tribal Environmental Science (TES) faculty and students conducted a review of climate change and its impact upon children and especially American Indian children.

16. Navajo Technical College

The project involved using dendrochronological data to infer how green house gases have changed over the past 400 to 500 years.

Convene one Tribal College Conference (Maps to APG 2 and Outcome 1: 1.1, 1.2).

NASA supported the 8th Annual Tribal College Forum at Northwest Indian College in Bellingham, WA, August 18-20, 2009, hosting over 100 tribal college faculty, students, elders, geospatial technology specialists, tribal natural resource managers, federal and state agencies, and the private sector. NASA also provided support for two meetings of the American Indian/Alaska Native Climate Change Working Group at Haskell Indian Nations University, and the meeting of “Red Alert: The Impact of Climate Change on Northwest Coast Tribal Fisheries” at Northwest Indian College.

Continue and enhance engineering classes, both distance and on-site, to be taught at a Tribal College in order to enhance engineering education at the TCUs. (*Maps to APG 3 and Outcome 1: 1.1, 1.2, 1.4, 1.5*) NASA delivered five courses by Goddard engineers: Computer Organization, Computer Architecture, Operating Systems, Signals and Systems, and Embedded Systems. The instructors have delivered the courses via videoconferencing augmented by short stays at SKC.

IMPROVEMENTS (e.g. project management, efficiencies, etc.) MADE IN THE PAST YEAR

- Implemented second iteration of experimental “externship” program to accommodate participants who have family or personal obligations which would otherwise prevent them from participating in the standard NASA internship (such as single parents, parents of young children and/or heads of households). The number of students and faculty participating in the externship was doubled. The initial 3-week training was held at a tribal college in Indian Country to make it possible for students to travel home if necessary on weekends, after which they spent 7 weeks conducting project research at their home institutions. This arrangement minimized the need to be away from home for a significant length of time (often a barrier for many TCU students), while providing valuable research methods training and experience.
- Enrichment grants were focused around a practical issue of direct relevance to local tribal impacts of climate change, thus demonstrating the value of NASA Earth science and STEM education in helping address local issues.
- Externship also provided hosting/organizational experience to United Tribes Technical College (UTTC) for the 3-week NASA introduction to STEM principles & NASA remote sensing providing the UTTC valuable project management training and experience.
- Increased participation by students (now more familiar with STEM-related issues and Earth sciences issues about their own local region or tribe) in STEM-related TCU events/activities – e.g., AIHEC Conference, American Indian/Alaska Native Climate Change Working Group, Tribal College Forum VIII.

- All NASA Externship program students gave power point presentations and presented a poster about their student project at one or more of the American Indian/Alaska Native Climate Change Working Group meetings, “Red Alert: The Impact of Climate Change on Northwest Coast Tribal Fisheries” at Northwest Indian College, and/or at the Tribal College Forum VIII.
- Closer coordination in the TCUP planning through more frequent and regularly scheduled conference calls among partners in the SRE externship and internship program.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The following partners were instrumental in project execution: American Indian Higher Education Consortium (AIHEC), The American Indian/Alaska Native Climate Change Working Group (AI/AN CCWG), American Indian Science and Engineering Society (AISES), United States Geological Survey (USGS), U.S. Environmental Protection Agency (EPA), North Dakota Tribal College Association, University Corporation for Atmospheric Research (UCAR) and National Center for Atmospheric Research (NCAR), The Climate Institute, Native View Project, and the Center for Remote Sensing of Ice Sheets (CReSIS) of the University of Kansas.